TITLE OF THE INVENTION

NON-CONTACT TYPE COMMUNICATION CARD AND NON-CONTACT

COMMUNICATION APPARATUS CONTROL METHOD

5   FIELD OF THE INVENTION

The present invention relates to the

transmission/reception of information stored in a card

(or an apparatus) capable of non-contact communication,

such as an IC card.

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BACKGROUND OF THE INVENTION

Conventionally, contact type cards designed to

read magnetically stored information have been mainly

used as cards used for automatic ticket gate systems in

15   railroads and entrance control systems in research

laboratories and the like. Recently, however,

non-contact type cards (IC cards and the like) have

been likely to be used. An advantage of a non-contact

type is that the user need not take out a commuter pass

20   or card from a pocket or handbag. Even if the user

needs to take out such a card from the bag, information

can be read when he/she only holds up the card against

a reading apparatus. There is no need to make the card

pass through the apparatus. In addition, the time

25   taken to read information can be shortened.

Furthermore, wear in the card can be prevented.

Moreover, a large amount of information can be stored

in an IC card or the like.

As described above, a non-contact type card is excellent in operability and can store a large amount of information. On the other hand, information may be
5 read out from the card at any moment. For example, as non-contact type cards are expected to become multifunctional more and more in the future, IC cards equipped with railroad commuter pass applications may also be equipped with credit card applications and the
10 like. In this case, in addition to holder's names, station names, and validity terms, other important information (e.g., credit information) may be stored in non-contact type cards. If important information is stolen from such a non-contact type card, the holder
15 cannot know when and where the information was stolen, and the information may be illicitly used before the holder knows it.

SUMMARY OF THE INVENTION
20 Accordingly, the present invention provides, for example, a technique of suppressing theft of information from a card designed to perform non-contact communication.

According to the invention, a non-contact type
25 communication card having a communication interface for non-contact communication of information is controlled to communicate with an external non-contact

communication apparatus, for example, only within a designated period of time.

In addition, with an arrangement based on any one of the embodiments to be described later, the present
5   invention can solve at least one of the above problems or other problems.

Other features and advantages of the present invention will be apparent from the following description taken in conjunction with the accompanying
10   drawings, in which like reference characters designate the same or similar parts throughout the figures thereof.

BRIEF DESCRIPTION OF THE DRAWINGS
15   The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

20   Fig. 1 is a block diagram showing an exemplary arrangement of this embodiment;

Fig. 2 is a view showing an example of the arrangement of a ROM;

Fig. 3 is a view showing an example of the
25   arrangement of a RAM;

Fig. 4 is a view showing a print example of information;

Fig. 5 is a view showing an exemplary outer appearance of a card;

Fig. 6 is a flow chart showing an exemplary process in the main routine;

5   Fig. 7 is a flow chart showing an exemplary process at the time of reception of a request;

Fig. 8 is a flow chart showing an exemplary process at the time of input operation; and

Fig. 9 is a view showing an example of how times

10   are designated.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will now be described in detail in accordance with the

15   accompanying drawings.

An outline of this embodiment will be described first. In the embodiment, a railroad commuter pass is used as an card application of a non-contact type card (e.g., an IC card). (Although a commuter pass will be

20   described in the embodiment, the present invention is not limited to this and can be applied to other kinds of card applications.) In the embodiment, when the holder of a non-contact type card equipped with a commuter pass application passes through a ticket gate

25   to take a train, the ticket gate transmits, to the commuter pass application, a signal for requesting the application to return information indicating an

entrainment section or valid section and adult or minor.

In response to this signal, the commuter pass

application transmits requested information to the

ticket gate. According to the embodiment, at this time,

5 the requested information can be displayed on the

display unit of the commuter pass. If the user does

not want to transmit information, he/she may set the

transmission of information in the OFF state by using a

hardware switch or software switch. In addition, the

10 user may set the time when transmission of information

is permitted, thereby allowing information to be

transmitted at only the set time. Furthermore, the

transmission time of information and the contents of

the transmitted information may be stored in a memory.

15 This allows the stored information to be displayed on

the display unit of the commuter pass afterward or to

be transferred to a personal computer to be managed.

Moreover, the user may designate in advance information

that may be transmitted unconditionally, e.g.,

20 information with low confidentiality. The user may

also designate information, e.g. important personal

information, is permitted to be transmitted only when a

specific condition is satisfied.

This embodiment will be described in detail below.

25 Fig. 1 is a block diagram showing the exemplary

arrangement of the embodiment. Reference numeral 101

denotes a ticket gate which transmits and receives

information.

Reference numeral 102 denotes a non-contact type card equipped with a commuter pass application, which may transmit/receive signals to/from the ticket gate.

5   The non-contact type card 102 may also display characters, images, and the like on a display unit, and can accept operation by keys. Reference numeral 103 denotes a transmission/reception unit which has an antenna capable of exchanging information in a

10   non-contact state; 104, a central processing unit (CPU) which controls various kinds of devices and executes program instructions; 105, a read only memory (ROM) in which programs and fonts are stored; and 106, a random access memory (RAM) (or a nonvolatile memory such as a

15   flash memory) in which data such as information about the holder of the commuter pass and a transmission log are stored. Note that the RAM 106 may include a DRAM serving as a work area for the CPU 104 and a flash memory for storing various kinds of data. Reference

20   numeral 107 denotes keys which are used for input operation such as time setting; 108, a display unit such as a liquid crystal display on which characters and the like are displayed; and 109, an input/output node for a computer (PC). The above devices are

25   connected to each other through a bus line BL (110).

Fig. 2 shows the exemplary arrangement of information stored in the ROM 105. This ROM stores a

program (PRG) to be executed by the CPU, font data (FONT) used for display, and the like.

Fig. 3 shows the exemplary arrangement of information stored in the RAM 106. Reference numeral

5   301 denotes holder information including NAME (name), AGE (age), ADDR (address), TEL (telephone number), and the like; 302, validity term information indicating that this commuter pass is valid from YMD1 (start date) to YMD2 (end date); and 303, information indicating

10 stations in a valid section. In this case, only two stations (STA1 and STA2) are shown. Obviously, however, many stations including transfer stations and the like may be stored, as needed.

Reference numeral 304 denotes information about

15 valid times that can be set by the holder of this commuter pass. In this case, two valid times, i.e., TIME1 and TIME2, are set. These valid times have widths (and hence can be called valid terms). For example, as shown in Fig. 9, TIME1 set to 8:00 a.m.

20 indicates that information can be transmitted between 7:50 a.m. and 8:10 a.m. In this case, a width of 10 min is set before and after the set time. If a communication start time (START_TIME1) and communication end time (END_TIME2) are stored in a pair,

25 a communication permission term can be freely set. Alternatively, a communication start time (START_TIME) and communication permission term (AVAILABLE_TERM) may

be stored in a pair. Although the times at which
communication is permitted are designated in this
embodiment, the times at which communication is
prohibited may be input and designated.

5   Reference numeral 305 denotes switch information.
When the switch is in the ON state (SW = 1), the
transmission of information is permitted. When the
switch is in the OFF state (SW = 0), the transmission
of information is prohibited. In other embodiments, the
10   switch may be in the other state such as SW=2, 3 or the
like. For example, if SW=2, the transmission of
information may be prohibited according to condition of
a corresponding communication entity.

Reference numeral 306 denotes an outgoing
15   information log. As the log registration area becomes
full, information is sequentially deleted from the
start.

Fig. 4 shows an example in which a commuter pass
card is connected to a computer, and the log
20   information stored in the commuter pass card is printed
by a printer. Date, time, and transmission contents
are printed in each field in the order named from the
left. In the case shown in Fig. 4, with regards to
fields 401 and 402, it is expected from the
25   transmission times that the data were transmitted to a
ticket gate. With regard to a field 403, however, only
the name was transmitted, and hence it can be expected

that this data was transmitted to something other than a ticket gate.

Fig. 5 shows an outer appearance of an exemplary commuter pass card. Reference numeral 501 denotes a

5   printing surface on which the contents of the commuter pass are printed; 502, a key group for setting valid times; 503, a permission/prohibition switch for information transmission; 504, a display unit such as a liquid crystal display, on which the types of

10   information required are displayed; and 505, a contact terminal (interface) for a computer.

The flow of processing in this embodiment will be described below with reference to the exemplary flow charts of Figs. 6 to 8. These flow charts concern

15   control programs stored in the ROM 105 or the like, which are basically executed by the CPU 104. Note that the process in Fig. 6 is the main routine, and the processes in Figs. 7 and 8 are interrupt processes. When the processes in Figs. 7 and 8 are terminated,

20   therefore, the flow returns to interrupt points in the main routine of Fig. 6.

The main routine of Fig. 6 will be described first. In step S601, the CPU 104 checks a key input. If there is a key input, the flow jumps to the flow

25   chart of Fig. 8 by an interrupt process.

In step S602, the CPU 104 checks the state of the switch. If the switch information stored in the RAM is

0, since information transmission is prohibited, the
CPU 104 performs control not to receive any information
either. If the switch information is 1, since
information transmission is permitted, the flow

5   advances to the reception check in step S603.

In step S603, if information is actually received
in a standby state, the flow jumps to the flow chart of
Fig. 7 by an interrupt processing. If no information
is received for a predetermined period of time, the

10   flow returns to the key input check in step S601.

An interrupt process in the case shown in Fig. 7
in which information is received will be described next.
When information is received, the request contents are
displayed on the display unit in step 701.

15   In step S702, it is checked whether the current
time is the time when reception/transmission is
permitted. For example, the CPU 104 receives the
information of the current time transmitted from a
timer mounted in the pass card or a ticket gate, and

20   executes this decision processing. Upon determining
that the current time is a reception/transmission
permission time, the CPU 104 transmits information in
accordance with the request contents in step S703. In
step S704, the CPU 104 records a transmission log.

25   If the CPU 104 determines in step S702 that the
current time is not a reception/transmission permission
time, the flow returns to the main routine without

transmitting any information.

An interrupt process in the case shown in Fig. 8 in which key input operation is done will be described next.

5   First of all, in step S801, the type of input key is discriminated, and the flow branches to the corresponding step. In this case, the switch is also included in the classification of keys.

When the switch 503 is turned off, the CPU 104

10   sets 0 to SW in the RAM 106 (step S802). When the switch 503 is turned on, the CPU 104 sets 1 to SW (step S803).

When time setting/canceling operation is performed with the key group 502, the CPU 104 performs

15   time setting/canceling processing (step S804).

In the above embodiment, transmission information is recorded. However, reception request information may also be recorded. In this case, the above processing may be so changed as to perform at least

20   reception regardless of whether the switch is OFF.

A battery may be used alone as a power supply for a commuter pass. Alternatively, a commuter pass may be designed to operate on electricity generated by received radio waves like a data carrier or the like.

25   This embodiment has exemplified the commuter pass for passage through a ticket gate. However, the embodiment is not limited to transport facilities or

the like and can also be applied to an entrance card or the like which is used to simply enter and exit a room.

In the above embodiment, a program is stored in the ROM. However, a rewritable memory may be used as 5 the ROM, so that the program may be rewritten through a dedicated computer or the like.

In the above embodiment, the program stored in the ROM is executed by the CPU. However, part or all of the program may be implemented by a hardware circuit 10 to implement the present invention.

The card of the above embodiment includes the keys and switch. Obviously, however, these components may be provided outside the card. For example, the user may access the card 102 from, for example, a PC or 15 cell phone including a contact and/or non-contact card interface, and transfers the information input with the keyboard of the PC to store it.

In the above embodiment, the card designed to perform communication in a non-contact scheme has been 20 described. However, the present invention may be an apparatus such as a cell phone or portable information terminal which incorporates an arrangement (e.g., an IC) capable of implementing each function of the card described with reference to Fig. 1.

25 Examples for implementing the present invention described in the above embodiment will be described below.

In the above embodiment, time is used as one of the exemplary conditions, however, those skilled in the art should recognize that other equivalent condition may alternatively be used. Also combination of these

5   conditions may alternatively be applied.

(Example 1)

A non-contact communication type card according to Example 1 includes, for example, a communication component which communicates information in a

10   non-contact state, a time designation component which designates a communication permission time, and a communication control component which determines, upon receiving a communication request, whether or not the communication permission time designated by the time

15   designation component has been reached, permits communication by the communication component when determining that the permission time has been reached, and prohibits communication by the communication component when determining that the permission time has

20   not been reached.

(Example 2)

A non-contact communication type card according to Example 2, in the non-contact communication type card according to Example 1, further includes a

25   designation component which designates permission/prohibition of communication, and the communication control component further prohibits

communication by the communication component if
prohibition of communication is designated by the
designation component.

(Example 3)

5   A non-contact communication type card according
to Example 3, in the non-contact communication type
card according to Example 1, further includes a
recording component which records a log of
communication performed by the communication component.

10   (Example 4)

A non-contact communication type card according
to Example 4, in the non-contact communication type
card according to Example 1, further includes a display
component which displays information communicated by

15   the communication component.

(Example 5)

A non-contact communication type card according
to Example 5 includes a communication component which
communicates information in a non-contact state, a

20   designation component which designates
permission/prohibition of communication, and a
communication control component which prohibits
communication by the communication component when
prohibition of communication is designated by the

25   designation component.

(Example 6)

A non-contact communication type card according

to Example 6 includes a communication component which communicates information in a non-contact state, a recording component which records a log of communication performed by the communication component,

5 and a display component which displays information recorded by the recording component.

(Example 7)

A method according to Example 7 is a non-contact communication apparatus control method of controlling a

10 non-contact communication apparatus which has a communication component which communicates information in a non-contact state, including a time designation step of designating a communication permission time, and a communication control step of determining, upon

15 receiving a communication request, whether or not the communication permission time designated in the time designation step has been reached, permitting communication by the communication component when determining that the permission time has been reached,

20 and prohibiting communication by the communication component when determining that the permission time has not been reached.

(Example 8)

In a method according to Example 8, in the method

25 according to Example 7, the non-contact communication apparatus further includes a designation component which designates permission/prohibition of

communication, and in the communication control step, communication by the communication component is further prohibited if prohibition of communication is designated by the designation component.

5   (Example 9)

A method according to Example 9, in the method according to Example 7, further includes a recording step of recording a log of communication performed by the communication component.

10   (Example 10)

A method according to Example 10, in the method according to Example 7, further includes a display step of displaying information communicated by the communication component.

15   (Example 11)

A control method for a non-contact communication apparatus according to Example 11 is a control method for a non-contact communication apparatus which has a communication component which communicates information

20   in a non-contact state, and a designation component which designates permission/prohibition of communication, including a communication control step of prohibiting communication by the communication component when prohibition of communication is

25   designated by the designation component.

(Example 12)

A method according to Example 12 is a control

method for a non-contact communication apparatus which has a communication component which communicates information in a non-contact state, including a recording step of recording a log of communication

5 performed by the communication component, and a display step of displaying information recorded in the recording step.

(Example 13)

A computer-executable program according to

10 Example 13 is a computer program for controlling a non-contact communication apparatus which has a communication component which communicates information in a non-contact state, the program causing a computer to execute a time designation step of designating a

15 communication permission time, and a communication control step of determining, upon receiving a communication request, whether or not the communication permission time designated in the time designation step has been reached, permitting communication by the

20 communication component when determining that the permission time has been reached, and prohibiting communication by the communication component when determining that the permission time has not been reached.

25 (Example 14)

A computer-executable program according to Example 14 is a computer program for controlling a

non-contact communication apparatus which has a
communication component which communicates information
in a non-contact state, and a designation component
which designates permission/prohibition of
5   communication, the program causing a computer to
execute a communication control step of prohibiting
communication by the communication component when
prohibition of communication is designated by the
designation component.

10   (Example 15)

A computer-executable program according to
Example 15 is a computer program for controlling a
non-contact communication apparatus which has a
communication component which communicates information
15   in a non-contact state, the program causing a computer
to execute a recording step of recording a log of
communication performed by the communication component,
and a display step of displaying information recorded
in the recording step.

20   As has been described above, according to the
present invention, leakage of information from a
non-contact type card can be prevented. In addition,
since limitations can be imposed on the exchange of
information, the chance of theft of information can be
25   reduced. Furthermore, the exchange of information can
be checked. Moreover, recording the exchange of
information will help prevent theft of information.

The present invention can be applied to a system constituted by a plurality of devices, or to an apparatus comprising a single device. Furthermore, it goes without saying that the invention is applicable

5 also to a case where the object of the invention is attained by supplying a program to a system or apparatus.

As many apparently widely different embodiments of the present invention can be made without departing from the spirit and scope thereof, it is to be understood

10 that the invention is not limited to the specific embodiments thereof except as defined in the appended claims.